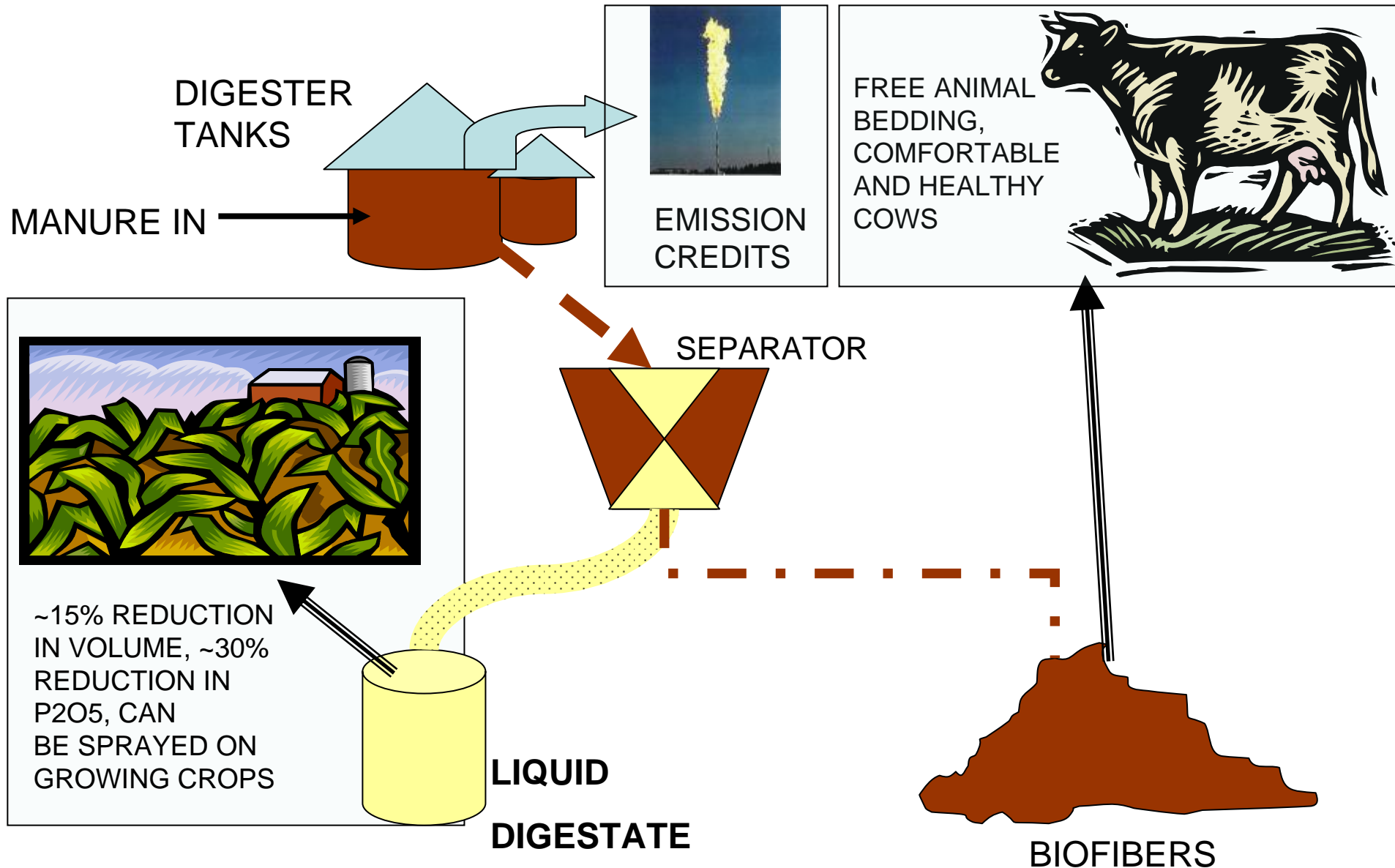


COWPATH TO THE CITY GATE

CREATING RENEWABLE
PIPELINE-QUALITY
NATURAL GAS ON THE FARM

"BARE BONES" SYSTEM FOR TYPICAL 1000-COW DAIRY



POTENTIAL ENERGY PRODUCTION FROM 1000-COW DAIRY

Assumptions:

Manure Volume - Gallons

10,950,000

Assumed Total Solid %'s

8%

Co-feed - Gallons

0

50% CH₄ producer

Biogas Production per year - cft

44,895,000

49,275,000

51,465,000

Biogas Flowrate - cft / minute

85

94

98

cft of methane per year

24,692,250

29,565,000

31,908,300

MMBTU's per year (millions)

24,890

29,802

32,164

MMBTU's per hour

2.8

3.4

3.7

CFT CH₄ PER DAY

67,650

81,000

87,420

Farm usage only MMBTU's factored for
conversion efficiency

7,320

Farm Usage % of Energy generated

29%

25%

23%

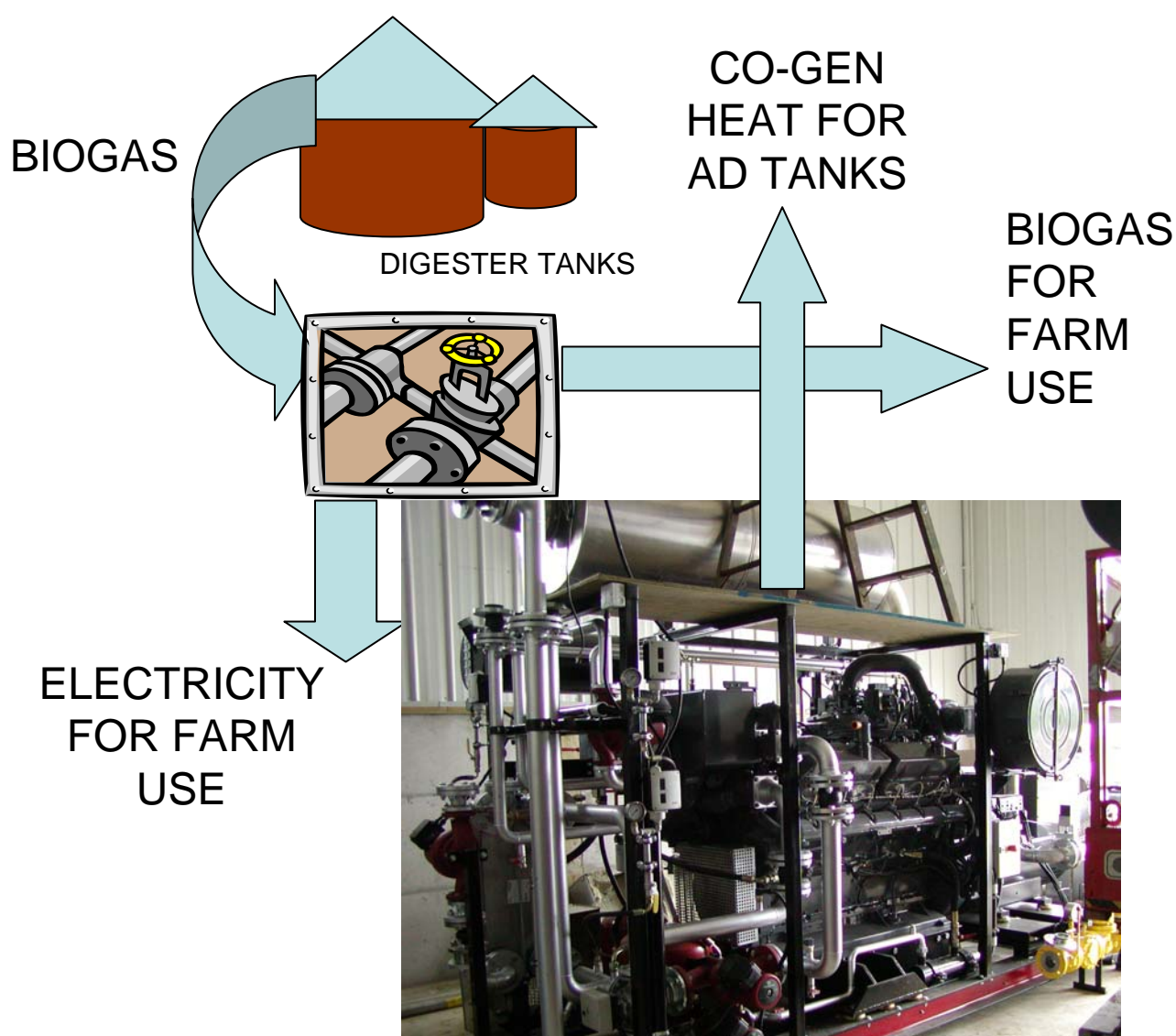
Energy generated % of farm usage

340%

407%


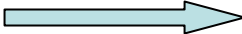
439%

ON FARM ENERGY USE - *RENEWABLE, MINIMAL EMISSIONS, LOW COST*



BOTTOM LINE FOR ON-FARM ENERGY REPLACEMENT

Capital Purchases

Biogas Plant		\$502,000
Gen-Set(s)		\$75,000
Separator & Building		\$100,000
Boiler		\$10,000
Electrical and Interconnection		\$100,000
Other Capital Purchases		\$200,000
Engineering		\$24,675
Admin		\$24,675
Contingencies		\$74,025
Total Capital		<hr/> \$1,110,375
less potential grant		(\$277,594)
Net Capital Investment		<hr/> \$832,781 <hr/>



BOTTOM LINE FOR ON-FARM ENERGY REPLACEMENT

Revenue

Sell Excess Bedding/Compost	\$7,775
Sell Sulfur - Fertilizer	\$145
Sale of Emission Credits	\$51,619
Total Revenues	<u>\$59,539</u>

Cost of Goods Sold

Savings Opportunities (favorable)

Electricity		(\$58,696)
Propane		(\$24,447)
Sand Purchase		(\$58,035)
Sand Hauling		(\$32,242)
Manure Hauling		(\$19,710)
Total Savings		<u>(\$193,130)</u>

BOTTOM LINE FOR ON-FARM ENERGY REPLACEMENT

Operating Costs

Gen-Set Oper & Maint	\$13,140
Cost to remove Sulfur	\$1,538
Other Operating Costs	\$25,000
Total Operating Cost	<u>\$39,678</u>

Total Cost of Goods Sold

(\$153,452)

Gen'l & Admin Expense

\$10,000

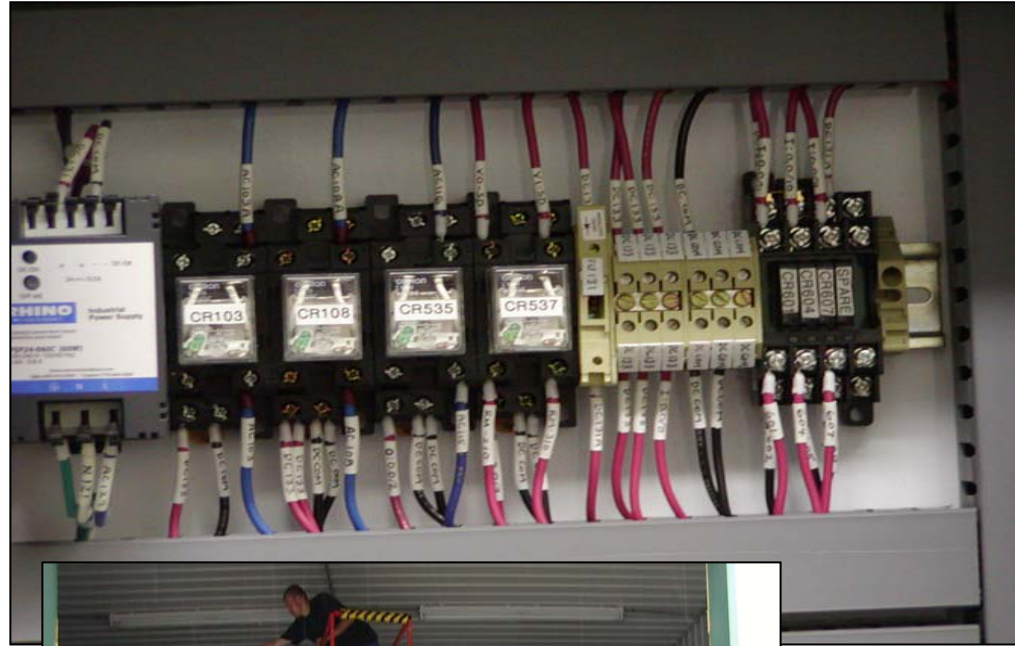
Operating Income (before Depr & Int)

\$202,990

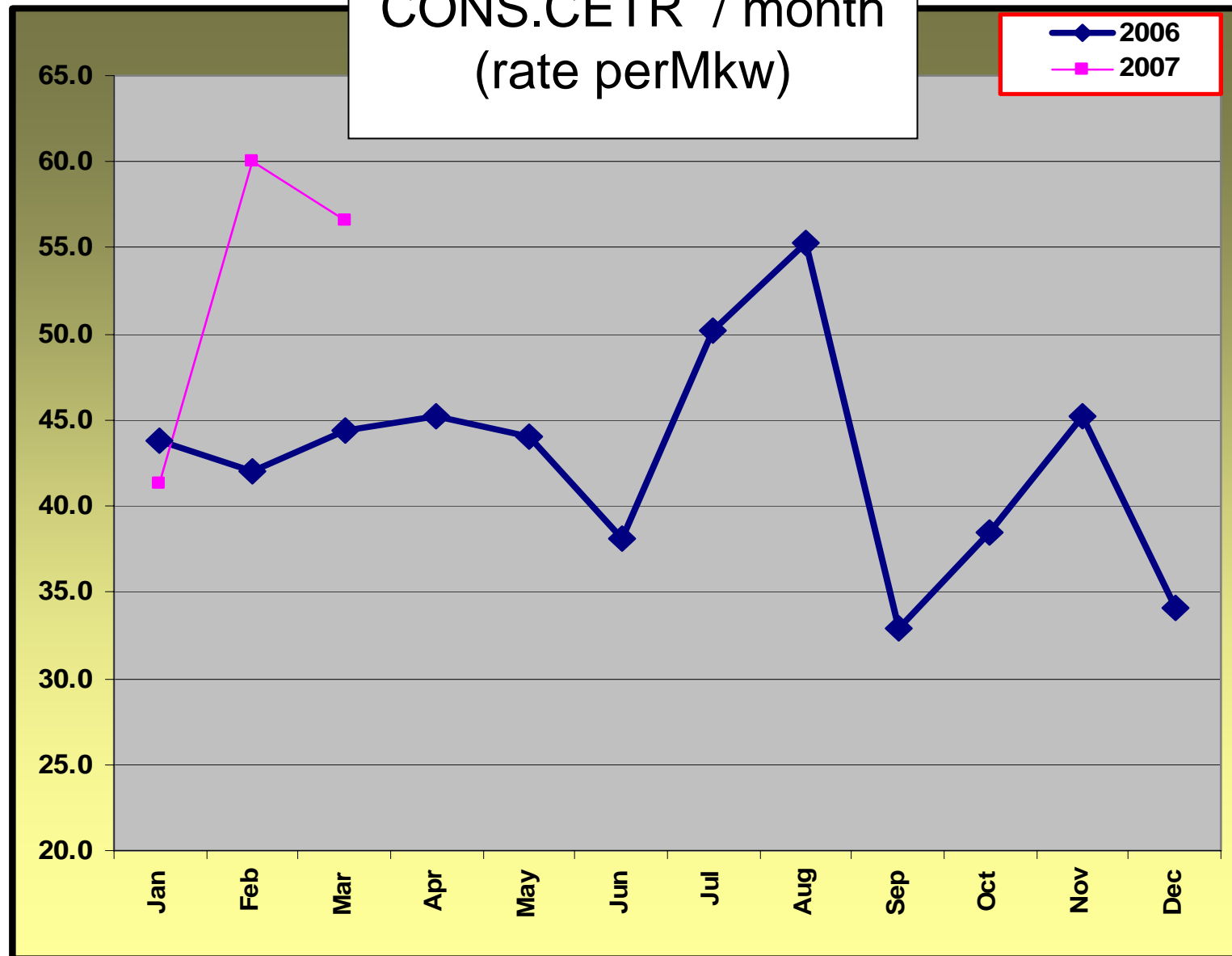
Returns

Simple Payback (# of years)	4.1
MIRR (10 years)	7.0%
ROI (# of yrs)	7.1

OPTIONAL SALE OF ENERGY – *BUT AT WHAT INVESTMENT COST?*



LMP avg price -
CONS.CETR / month
(rate perMkw)



ECONOMICS OF SELLING ELECTRICITY - @\$0.0378/kWh

	Farm Only A	Farm + Elec B
Revenue		
Sell Energy	\$0	\$90,903
Sell Excess Bedding/Compost	\$7,775	\$7,775
Sell Sulfur - Fertilizer	\$145	\$591
Sell Emission Credits	\$51,619	\$58,028
Total Revenue	\$59,539	\$157,296

ECONOMICS OF SELLING ELECTRICITY - @\$0.0378/kWh

	Farm Only A	Farm + Elec B
Operating Costs		
Gen-Set O&M	\$13,140	\$45,990
Cost to remove Sulfur	\$1,538	\$6,262
Other Oper Costs	\$25,000	\$25,000
Total Operating Cost	\$39,678	\$77,252
Total Cost of Goods Sold	(\$153,452)	(\$115,878)
General & Administrative Expenses	\$10,000	\$10,000
Operating Income (before depr&Int)	\$202,990	\$263,173

ECONOMICS OF SELLING ELECTRICITY - @\$0.0378/kWh

Capital Purchases

Biogas Plant

Gen-Set(s)

Separator & Building

Boiler

Electrical and Interconnections

Other Capital

Total Capital Purchases

Other Capital Cost

Engineering & Admin

Contingencies

Total Other Capital Costs

Total Capital Cost

Farm Only A	Farm + Elec B
\$502,000	\$502,000
\$75,000	\$350,000
\$100,000	\$100,000
\$10,000	\$10,000
\$100,000	\$150,000
\$200,000	\$200,000
\$987,000	\$1,312,000
\$49,350	\$65,600
\$74,025	\$98,400
\$123,375	\$164,000
\$1,110,375	\$1,476,000

After grant ROR

Simple payback (yrs)	4.1	4.2
10yr MIRR	7.0%	6.6%
ROI (yrs)	7.1	7.4

Need
\$0.0415/kWh
to have equal
ROR

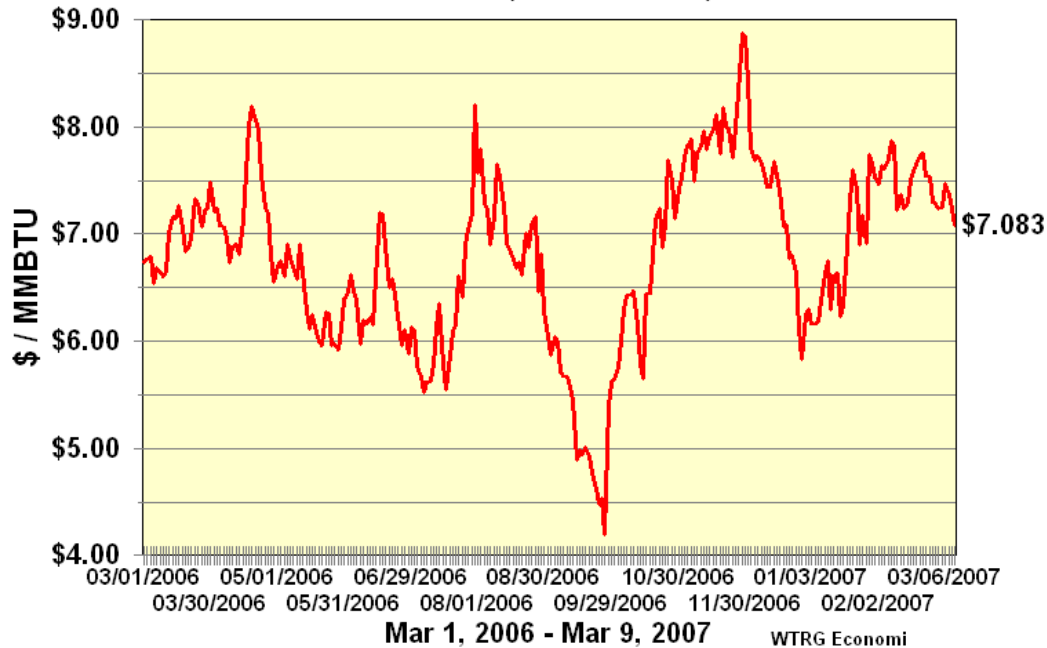
ANOTHER OPTION - PIPELINE-QUALITY NATURAL GAS



NATURAL GAS PRICING

- WHAT'S YOUR PREDICTION?

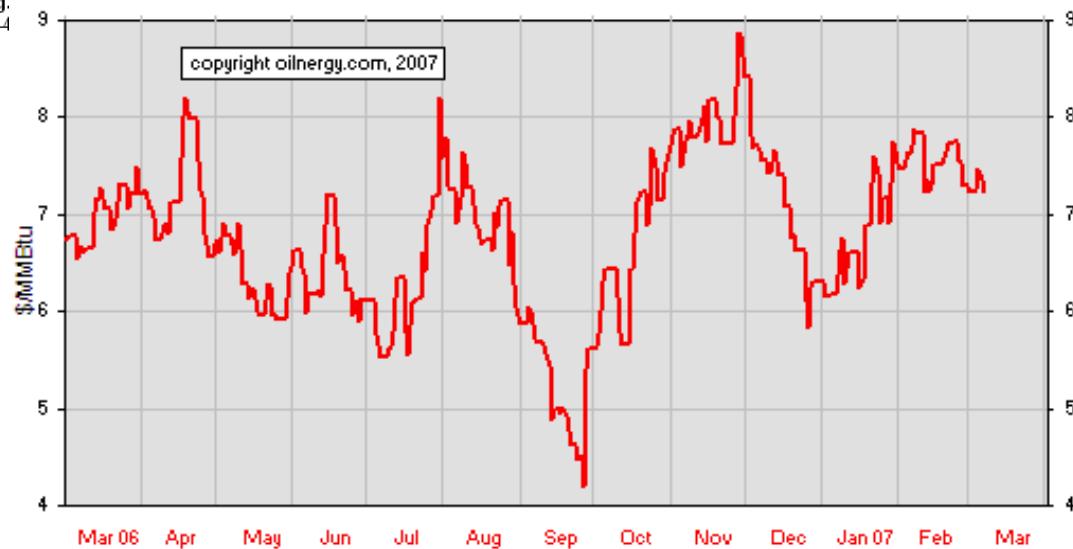
NYMEX Natural Gas Futures Close (Front Month)



— Close

WTRG Economi
www.wtrg.
(479) 293-4

NYMEX Henry-Hub Natural Gas - 12 previous months



FIRST COMBINATION ON-FARM RENEWABLE ENERGY PRODUCTION FACILITY

SCENIC VIEW DAIRY

FENNVILLE, MI

FEED GAS: UP TO 175 CFM

PRODUCT GAS: ~100 CFM

INSERTION PRESSURE: 120-140 PSIG



BOTTOM LINE COMPARISON

ENERGY SALES

25,130 Total volume (1000 cft) of Natural Gas available for Pipeline / year

\$175,912 Potential Natural Gas Revenue Stream / year

Price Range - Natgas price/1000cft			Revenue Range / year		
<u>Low</u>	<u>Modeled</u>	<u>High</u>	<u>Low</u>	<u>Modeled</u>	<u>High</u>
\$4.000	\$7.000	\$10.000	\$100,521	\$175,912	\$251,303

OR

3,057,014 Total volume (kWh) of Electricity Production / year

\$115,555 Potential Electricity Revenue Stream / year

Price Range - Elec price/kWh			Revenue Range / year		
<u>Low</u>	<u>Modeled</u>	<u>High</u>	<u>Low</u>	<u>Modeled</u>	<u>High</u>
\$0.030	\$0.038	\$0.060	\$91,710	\$115,555	\$183,421

SCENIC VIEW STRATEGY – HIT BOTH HIGHS!

SELL PEAK ELECTRICITY, SHIFT REST TO PIPELINE

BOTTOM LINE COMPARISON

	Farm Only A	Farm + Elec B	Farm + Pipeline D
Revenue			
Sell Energy	\$0	\$90,903	\$132,703
Sell Excess Bedding/Compost	\$7,775	\$7,775	\$7,775
Sell Sulfur - Fertilizer	\$145	\$591	\$642
Sell Emission Credits	\$51,619	\$58,028	\$56,051
Total Revenue	\$59,539	\$157,296	\$197,170

BOTTOM LINE COMPARISON

	Farm Only A	Farm + Elec B	Farm + Pipeline D
Operating Costs			
Gen-Set O&M	\$13,140	\$45,990	\$13,140
PSA & Compressor			\$90,666
Cost to remove Sulfur	\$1,538	\$6,262	\$9,393
Other Oper Costs	\$25,000	\$25,000	\$25,000
Total Operating Cost	\$39,678	\$77,252	\$138,199
Total Cost of Goods Sold	(\$153,452)	(\$115,878)	(\$54,931)
General & Administrative Expenses	\$10,000	\$10,000	\$10,000
Operating Income (before depr&Int)	\$202,990	\$263,173	\$242,101

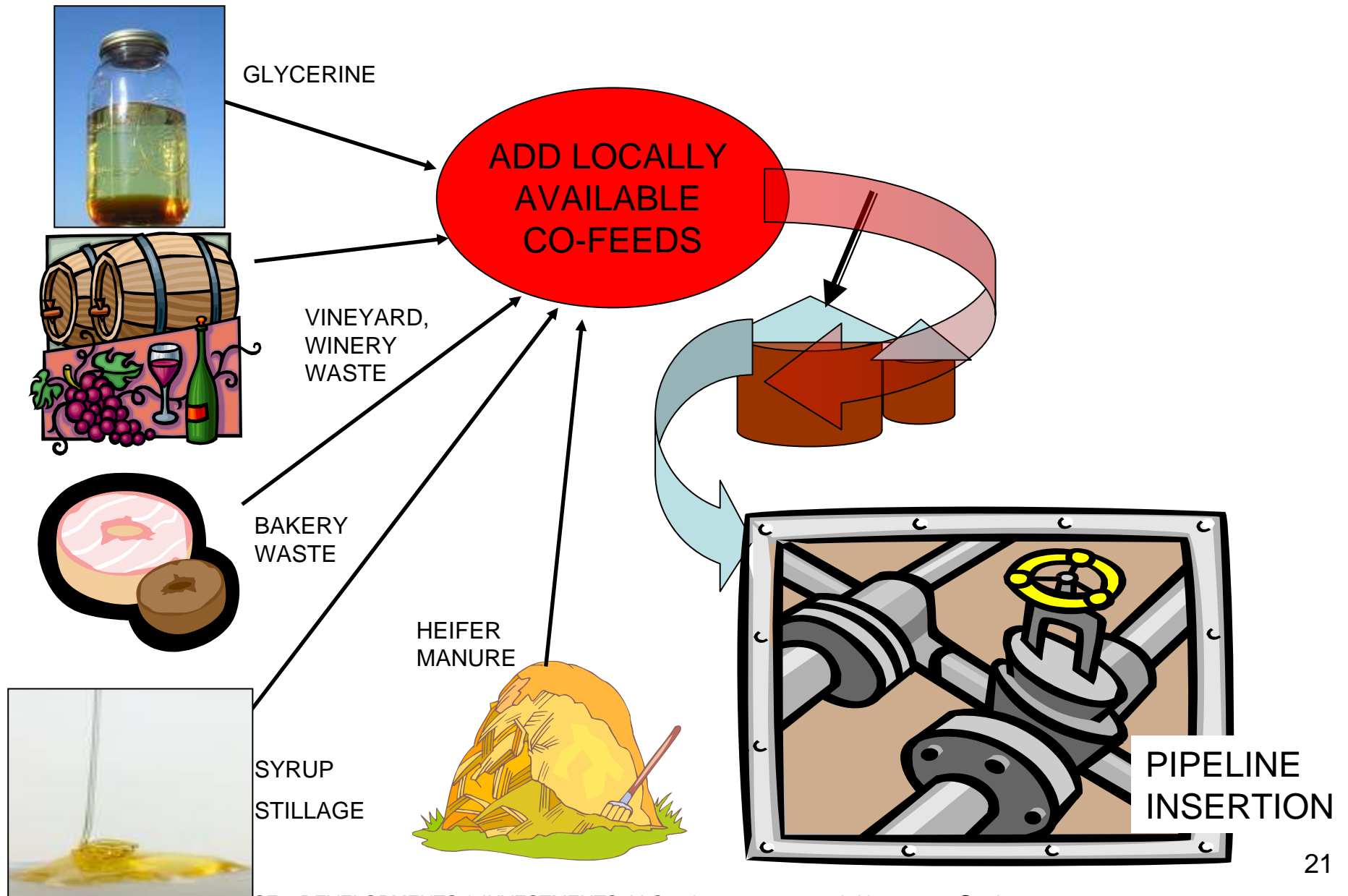
BOTTOM LINE COMPARISON - LOW VOLUME HURTS ROR OF PIPELINE SYSTEM

Capital Purchases			
Biogas Plant	\$502,000	\$502,000	\$502,000
Gen-Set(s)	\$75,000	\$350,000	\$75,000
Separator & Building	\$100,000	\$100,000	\$100,000
Boiler	\$10,000	\$10,000	\$10,000
PSA & Compressor			\$315,000
Electrical and Interconnections	\$100,000	\$150,000	\$250,000
Other Capital	\$200,000	\$200,000	\$200,000
Total Capital Purchases	\$987,000	\$1,312,000	\$1,452,000
Other Capital Cost			
Engineering & Admin	\$49,350	\$65,600	\$72,600
Contingencies	\$74,025	\$98,400	\$108,900
Total Other Capital Costs	\$123,375	\$164,000	\$181,500
Total Capital Cost	\$1,110,375	\$1,476,000	\$1,633,500

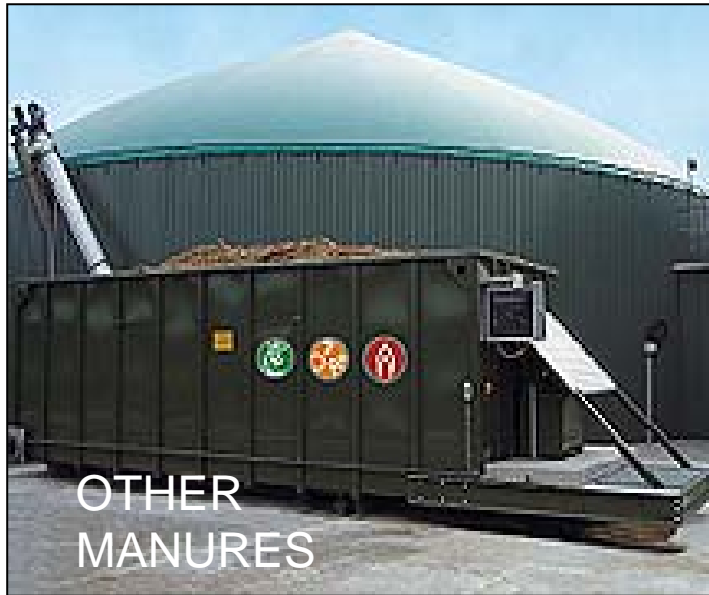
After grant ROR

Simple payback (yrs)	4.1	4.2	5.1
10yr MIRR	7.0%	6.6%	3.2%
ROI (yrs)	7.1	7.4	9.8

INCREASE RATE OF RETURN BY ADDING HIGH ENERGY CO-FEEDS



FEEDSTOCK OPTIONS TO INCREASE BIOGAS PRODUCTION



ADDING JUST 5% CO-FEED

CAN GREATLY INCREASE BIOGAS PRODUCTIVITY

Assumptions:

Manure Volume - Gallons
Assumed Total Solid %'s
Co-feed - Gallons

10,950,000

8%

547,500

50% CH4 producer

INCREASE OF
175%

Biogas Production per year - cft

Biogas Flowrate - cft / minute

cft of methane per year

MMBTU's per year (millions)

MMBTU's per hour

CFT CH4 PER DAY

Farm usage only MMBTU's factored for
conversion efficiency

7,320

Farm Usage % of Energy generated

Energy generated % of farm usage

22d	24d	28d
83,220,000	87,600,000	89,790,000
158	167	171
43,854,750	48,727,500	51,070,800
46,137	52,980	56,115
5.3	6.0	6.4
120,150	133,500	139,920
16%	14%	13%
630%	724%	767%

HIGHER POTENTIAL ENERGY SALES

ENERGY SALES

44,676 Total volume (1000 cft) of Natural Gas available for Pipeline / year

\$312,732 Potential Natural Gas Revenue Stream / year

Price Range - Natgas price/1000cft			Revenue Range / year		
<u>Low</u>	<u>Modeled</u>	<u>High</u>	<u>Low</u>	<u>Modeled</u>	<u>High</u>
\$4.000	\$7.000	\$10.000	\$178,704	\$312,732	\$446,760

OR

5,434,692 Total volume (kWh) of Electricity Production / year

\$205,431 Potential Electricity Revenue Stream / year

Price Range - Elec price/kWh			Revenue Range / year		
<u>Low</u>	<u>Modeled</u>	<u>High</u>	<u>Low</u>	<u>Modeled</u>	<u>High</u>
\$0.030	\$0.038	\$0.060	\$163,041	\$205,431	\$326,082

CAPEX INCREASES FOR HIGHER ELECTRICITY PRODUCTION - BUT PIPELINE SYSTEM STILL ADEQUATE

Capital Purchases			
Biogas Plant	\$502,000	\$502,000	\$502,000
Gen-Set(s)	\$75,000	\$700,000	\$75,000
Separator & Building	\$100,000	\$100,000	\$100,000
Boiler	\$10,000	\$10,000	\$10,000
PSA & Compressor			\$315,000
Electrical and Interconnections	\$100,000	\$150,000	\$250,000
Other Capital	\$200,000	\$200,000	\$200,000
Total Capital Purchases	\$987,000	\$1,662,000	\$1,452,000
Other Capital Cost			
Engineering & Admin	\$49,350	\$83,100	\$72,600
Contingencies	\$74,025	\$124,650	\$108,900
Total Other Capital Costs	\$123,375	\$207,750	\$181,500
Total Capital Cost	\$1,110,375	\$1,869,750	\$1,633,500

BOTTOM LINE COMPARISON

	Farm Only A	Farm + Elec B	Farm + Pipeline D
Revenue			
Sell Energy	\$0	\$180,779	\$269,523
Sell Excess Bedding/Compost	\$8,326	\$8,326	\$8,326
Sell Sulfur - Fertilizer	\$151	\$1,090	\$1,141
Sell Emission Credits	\$83,937	\$96,681	\$92,937
Total Revenue	\$92,414	\$286,877	\$371,928

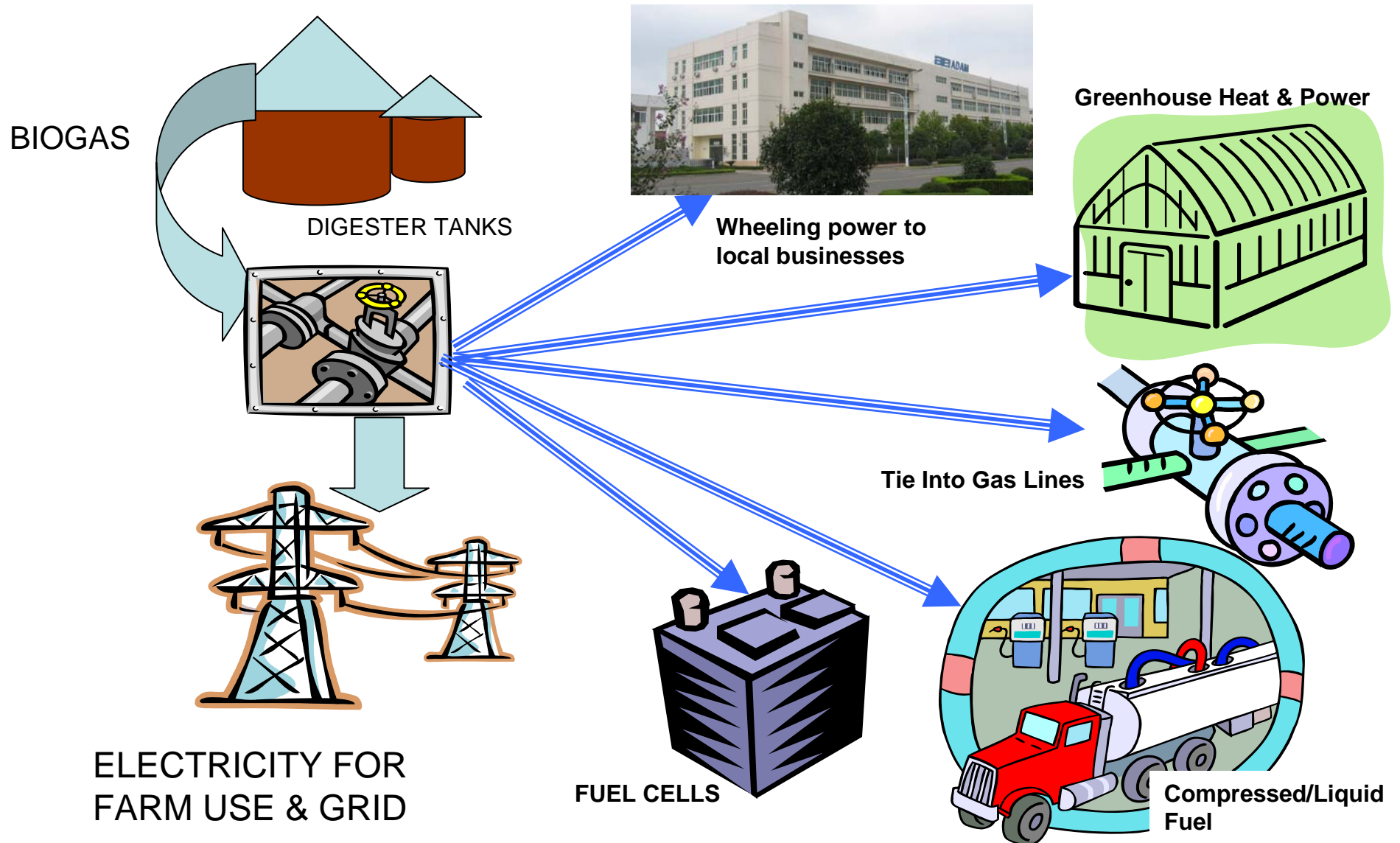
After grant ROR

Simple payback (yrs)	4.1	4.6	3.3
10yr MIRR	6.8%	5.1%	10.7%
ROI (yrs)	7.3	8.4	5.3

WAS 7.4 yrs

was 9.8 yrs

EXPANDING OPTIONS IS KEY TO ACCELERATING GROWTH IN RENEWABLE ENERGY



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TURNING MANURE INTO
MONEY